O'SHAUGHNESSY DAM

Columbus' Best Insurance Policy

By WALTER H. SCHOTTS, '27

COLUMBUS has within the last year finished one of the largest projects for the compounding of water ever attempted by any city in the Buckeye State. It now stands completed and ready for use after six years, which was necessary for the completion of all work concerned.

In 1908, the city started the operation of a new water supply system, consisting of what was known as the Griggs storage dam, a pumping station for pumping both raw and pure water and a purifying system that would insure the people of the city as safe a water as could be found anywhere.

The 1909 records show the population of Columbus to be 177,000. The average daily consumption at this time was 12,700,000 gallons, thus giving an average consumption of 71 gallons per person per day. This was sufficiently adequate at the time. In 1923, the population of the city had increased to 261,000, with an average daily water consumption of 23,100,000 gallons. This large consumption for some reason or another raised the avarage daily consumption to 89 gallons per person. Thus in the past fourteen years, there was an increase in population of 47½%, or about 6,000 per year, while the consumption of water increased 82%, or about 720,000 gallons per day for each year. Before the year 1923, with the several water famines the city had experienced, there arose the necessity of furnishing the people with a larger water supply.

During the summers of 1919 and 1920, there were very dry seasons in which the water supply became very low and the people of the city were asked to conserve it in every way possible. This with the continued growth of the city spurred the city council to action. On Feb. 7, 1921, the council proposed the construction of a new storage dam which was to be built somewhere above the old Grigg's dam on the Scioto river. At the same time they decided to name and designate this dam the "O'Shaughnessy Dam," in honor of the late Jerry O'Shaughnessy, who so faithfully and well served the City of Columbus as Superintendent of Water Works for many years. To make this dam unique and different from the old one, they planned to build a bridge across the top of it and to build a beautiful boulevard system in the surrounding country.

Out of every 100 gallons of rain falling on the water shed of the Scioto river, only 33 gallons finds its way to the river and from this amount only 1.3 gallons is taken as water supply at that time. Average conditions vary so that storage is necessary to provide water supply when the run-off from the water shed is less than that necessary for water supply purposes. Accordingly, the city set surveyors to work drilling and testing to find a suitable location to build on. They finally agreed on a site which is located three miles west of Powell Station on the Hocking Valley railroad and about sixteen miles north of Columbus on the Scioto river.

To make their idea a reality, council granted the expenditure of the necessary funds and the engineers released the plans and specifications for bids in the spring of 1922. On June 6, 1922, the following men met in the Mayor's office and signed the contract for the work: Arthur Holbrook, office engineer; John P. McCune, Director of Public Safety; Charles A. Leach, city attorney; E. M. Slemmons, secretary to the service director; Charles B. Hoover, engineer-in-charge and head of the city water works division; William H. Duffy, Director of Public Service; C. B. Cornell, field engineer, and V. E. Winell and E. G. Linde, representing the Thompson-Starrett Co., of New York, the general contractors whose bid was accepted.

At the time the contract was signed, the city had not as yet acquired one foot of property on which the dam was to be thereby constructed or the water to be impounded. As the contractors wanted to move their equipment on the grounds within two weeks' time, it was necessary to acquire all the territory needed for the completion of the dam. The city attorney's office was forced to work under a forced draft to purchase the necessary acreage. Believing that proper, dependable and well considered appraisement was half the battle, they proceeded with the work. Knowing that Columbus appraisers would not be familiar with land in Delaware county, they decided to choose five highly recommended men of that county for the work. As a result of conferences with many farmers in that vicinity, A. S. Conklin, president of the Deposit Bank of Delaware; Edward S. Mendenhall, an owner of land near the dam; H. E. Sharp, a business man of Powell; Howard Humphrey, Mayor of Delaware, and James D. Pinney, a mill and lumberman of Worthington, were chosen. As a result of the reports made by these men, all land on the site where the dam now stands was obtained in two weeks' time, therefore not delaying the contractor a single day. Work then abvanced to gain the remaining part of the land of about 1,200 acres, consisting of fifty-nine different tracts. Many buildings and dwellings were moved to safety and several new roads were planned to replace the old ones which would be inundated after the impounding of the water. Among these was the power house, laundry and sewage disposal plant of the Girls' Industrial School, which were moved to higher ground and the roadway on the east bank of the river was moved farther back. All this work was done at the city's expense. The city attorney then devoted two and one-half years to the purchase and condemnation of remaining property, and all of this work was finished without calling in help from outside the office. Prices paid were normal and less litigation grew out of the acquisition of property for the O'Shaughnessy Dam than the Griggs Dam.

On June 13, 1922, actual work was first started when three men were employed to clear away timber and underbrush, as well as drilling a well which was to furnish water for all concerned. Immediately following this operation the engineer's office was constructed. This was a very simple one-story structure with a cellar under a portion of it which was to house the electric light plant. Running water was provided for by the use of an electric pump. In a short while a miniature city could be seen as bunk houses were constructed for the use of the men who worked night and day until cold weather set in.

On June 22d, the first steam shovel was brought on the grounds and was used continually for a long period of time thereafter to clear away slate, stone or soil. Surveyors and men worked hard so that Nov. 1, 1922, saw the forms completed for the first pouring of concrete.

Work then proceeded night and day as the weather would permit throughout the winter and the following summer. Six hundred men were in the employ of the Thompson-Starret Company most of the time. Work then proceeded steadily with the blasting of stone, mixing and pouring of concrete, crushing of stone and form building. Everything proceeded without delay until all work was finished.

E. J. Fitzgerald was general superintendent of the job from the time actual work was started until August of 1923, when he was replaced by E. J. Hemmings, who assumed the duties until Nov. 1, 1924, when James Toms, engineer for the Thompson-Starrett Co., general contractors, "came on," taking over the work. He remained until the dam was completed. All the duties of platting for the various roadways which were constructed, replacement of buildings which were removed or the construction of new ones, the building of new bridges and the removal of houses and cleaning and grubbing, were under the direct supervision of C. B. Cornell, field engineer for the city.

The dam proper is conservative in that it is used as the base for a bridge as well as the impounding of water. The limestone base on which the dam is constructed is of a very solid nature with very little soil covering it. The point at which excavation was deepest was the cut-off trench which is 84.8 feet below the crest of the dam, or 106.5 feet below the sidewalks on the bridge. This low point of excavation was only carried out in four sections of the twelve, as it is built on the plan of steps, each section growing shallower as they approach the banks of the river. The sloping contour of the sections are built such that at the top they are a parabola with the equation ($X^2 = 33.71Y$), then they are straight for a short distance and finally at the bottom rounding into an arc of a circle. These sections range in height from 84.8 feet to 25 feet. There is a copper strip three inches wide between each section, which is necessary to take care of the contraction and expansion which takes place in the stone work.

The overall length of the dam is 1,005 feet, 4 inches, with a total length of spillway of 879 feet. Due to the piers of the bridge, the effective length of the spillway is cut down to 774 feet. The thickest portion of the base is 110 feet. The main body of the spillway is made of what is known as class "A" cyclopean masonry, which is a very coarse variety of concrete in which large stones or other rock material may be placed after the concrete is mixed, with a finer and smoother concrete forming the outer covering. The limestone was cut into in such a manner as to resemble saw-teeth and ditches. This enabled the concrete to hold better after being poured into the cavities, and the chance of slipping was greatly reduced. All stone excavated was either used in the mixing of concrete or for filling in the class "A" concrete.

The piers of the bridge, reinforced with steel bars, are built into the spillway. There are ten simple and one compound piers. They are each seven feet wide and taper to an elliptical point. The compound pier provides extra support for the outlet gate house, and is in the center of the bridge. It is thirty-five feet wide.

The arches of the bridge are similar to each other in all respects. Each span is 71½ feet wide from center of pier to center of pier and have a clear distance of 64½ feet between the piers. The bottom of the arches is 18 feet above the crest of the dam, 5½ feet above the calculated high water level. There is a sufficient clearance thus gained to offset any unnecessary strain that might be put on the bridge during a high water level. The arches, of the bridge spans are not built solidly of concrete, as might be supposed, but merely have a concrete frame on the sides and underneath. The hollow portion is filled with clean cinders which help to reduce the total weight of the bridge. All of the concrete work in the bridge is very well reinforced with steel, most of the reinforcement rods ranging from one-half to three-fourths inch in diameter and are spaced about six inches apart in all instances.

A roadway 17½ feet wide is built over these arches. The roadway is of brick placed on sand. It is sloped like any street and has a 6-inch gutter on either side. These gutters lead to an efficient drainage system. On both sides of the roadway is a 4-foot walk which extends from the balustrades to the gutter. Ornamental balustrades of concrete and cut stone give the artistic touch to the huge mass of concrete and are similar to those seen on any other concrete bridge. The banister has an overall dimension of 3½ feet high by 1½ feet in width. They extend from one end of the bridge to the other in that proportion.

At either end and in the center is a structure whose base is built beyond the back of the dam. They are all of uniform size, that being 32½ feet square and about 24 feet high. The east pavilion is known as the observation pavilion and can be used by the public. It is open on all sides and is artistically decorated with arches and balustrades.

The middle structure is the outlet gate chamber. It is similar to the pavilion except that it is totally enclosed. Inside of this structure is located the sluice gate controls. On the vertical side facing the water there are twelve openings which are symmetrically placed along the whole side of the structure. They are 4 by 7½ feet and they admit water to the sluice gates. At the very base of this structure and at the lowest level of the river are four 48-inch pipes which takes care of the normal flow of the river. These can be closed with sluice gates at the time it is necessary to do so. One gate controls two of the openings in the outlet gate. The sluice gates are raised by hand power. There is a horizontal shaft to which a vertical shaft is attached by gears and by turning the crank on the horizontal shaft the sluice gates are thus raised. The ratio between these gears is very great in order to do this. The gates are made of bronze and are 3 by 5 feet.

The pavilion at the west end of the dam, a reproduction of the others, will house the power gate apparatus in the near future. In this will be found hydro-electric apparatus which will operate when the river has filled the dam to a sufficient height to do so. The water is led to this structure by a channel which is cut into the rock.

It is estimated by the engineers in charge that 75,000 trees were cut down in clearing away the land for the impounding of the water. Seventy-five per cent of this wood was burned while the rest was removed for various reasons.

At the time of starting the construction of this dam, many people were pessimistic about spending so much money when it was not needed to meet the demands of the city. But now since it is completed and by its aid the city has successfully tided through one of the worst water famines in years, all agree now that it did not come before it was needed.

Comparative Data of the Two Dams Owned by Columbus

Total length of dam (concrete)	1,006 ft.	1,005 ft.
Total length of spillway	500 ft.	879 ft.
Effective length of spillway	500 ft.	774 ft.
Maximum base width	65 ft.	110 ft.
Dry earth excavation	10.850 cu. yd.	23,000 c. yd.
Wet earth excavation	5,330 cu. yd.	15,000 c. yd.

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O'SHAUGHNESSY DAM

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Rock excavation	56,330 cu. yd.	83,000 c. yd.
Structural steel	11,460 lbs.	500,000 lbs.
Land	452 acres	1,170 acres
Clearing & grubbing	256 acres	740 acres
Water surface	363 acres	820 acres
Length of reservoir	5.8 miles	7.5 mi.
Mean width	516 ft.	900 ft.
Maximum depth	35 ft.	68 ft.
Maximum width	850 ft.	2,200 ft.
Mean depth	14.5 ft.	20 ft.
Storage capacity	1,487,000,000 gal.	5,200,000,000 gal.
Contract price	$640,000.00	$2,200,000.00
Cu. yd. of concrete	56,330	82,930
Cost per cu. yd.	$ 4.94	$ 9.10
Cost per cu. yd. (rock excavation)	$ 1.50	$ 2.07
Cost per cu. yd. (earth excavation)	$ .53	$ 1.90
Cost per acre (land purchased)	$ 334.00	$ 237.00
Cost of clearing and grubbing (acre)	$ 79.00	$ 175.50
Cost of road construction (mile)	$12,670.00	$27,700.00